(1) Supreme Court, U.S.
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In The

Supreme Court of the United States

SEMITOOL, INC.,

Petitioner,

v.

NOVELLUS SYSTEMS, INC.,

Respondent.

On Petition For Writ Of Certiorari To The United States Court Of Appeals For The Federal Circuit

PETITION FOR WRIT OF CERTIORARI

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QUESTIONS PRESENTED

1. This petition presents the same question presented in *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 558 (CA Fed. 2000) (en banc): "Whether the finding of prosecution history estoppel completely bars the application of the doctrine of equivalents."

2. Because the Court has granted a writ of certiorari to the Federal Circuit in *Festo*, the most immediate question presented here is whether the Court should hold this petition until it rules in *Festo*.

CORPORATE DISCLOSURE STATEMENT

Semitool, Inc. has no parent company.

No publicly held company owns 10% or more of Semitool, Inc. stock.

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PETITION FOR WRIT OF CERTIORARI

Semitool, Inc. respectfully petitions for a writ of certiorari to review the judgment of the United States Court of Appeals for the Federal Circuit in this case.

OPINIONS BELOW

The opinion of the Court of Appeals for the Federal Circuit is unpublished, *Semitool, Inc. v. Novellus Sys., Inc.*, No. 00-1375 (Fed. Cir. June 8, 2001). The opinion of the District Court is also unpublished, *Semitool, Inc. v. Novellus Sys., Inc.*, No. 98-CV-3089 (N.D. Cal. March 17, 2000).

JURISDICTION

The Federal Circuit judgment was entered on June 8, 2001. The Court has jurisdiction pursuant to 28 U.S.C. § 1254(1).

CONSTITUTIONAL AND STATUTORY PROVISIONS INVOLVED

The United States Constitution provides that "Congress shall have the power . . . To promote the Progress of Science and useful Arts, by securing for limited Times to Authors and Inventors the exclusive Right to their respective Writings and Discoveries." U.S. Const. art. I, § 8, cl. 8.

The Patent Act states that "Except as otherwise provided in this title, whoever without authority makes, uses, offers to sell, or sells any patented invention, within

the United States or imports into the United States any patented invention during the term of the patent therefor, infringes the patent." 35 U.S.C. § 271(a).

I. STATEMENT OF THE CASE

Semitool, Inc. ("Semitool") brought this action for patent infringement against Novellus Systems, Inc. ("Novellus"). The district court (Northern District of California) had jurisdiction pursuant to 28 U.S.C. § 1338. The Federal Circuit affirmed summary judgment against Semitool, relying on its recent holding in *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 558 (CA Fed. 2000) (en banc).

A. Background and Technology

Semitool is the assignee of United States Patent Nos. 5,222,310 ("the '310 patent") and 5,337,708 ("the '708 patent"). The '310 patent and the '708 patent (collectively, "the Semitool patents") both issued from the same application. Each of the Semitool patents is directed to an apparatus for the processing of semiconductor wafers.

Processing a semiconductor wafer transforms it from plain silicon to hundreds of integrated circuits, or computer chips. Wafer processing usually involves several distinct procedures. Some phases may involve liquid chemicals, and some may involve gaseous chemicals.

Both Semitool patents claim their inventions for use in wafer processing generally. Neither patent limits use of

the patented apparatus to a certain step or procedure.[1] The patents do specify that the processing takes place in a chamber or space that is formed by the relationship between a "head" and a "bowl."

The '310 and '708 patents both use the language "substantially enclosed" to describe the wafer processing space within the bowl of the claimed apparatus. The head and the bowl of the apparatus, when in a "closed" position, form a "substantially enclosed processing chamber" in the '708 patent and a "substantially enclosed processing space" in the '310 patent.[2] The "substantially enclosed" limitation was added during the process of patent prosecution, for a reason substantially related to patentability under *Festo*.

Semitool added the "substantially enclosed" limitation to show that its invention was different from that claimed in an earlier patent granted to Aigo. The device claimed in the Aigo patent had a head and a bowl, like those described in the Semitool patents, but during operation, the head remained some distance above the bowl. The open space between them, where the wafer processing occurred, was entirely unconfined.

Novellus manufactures and sells wafer processing tools, in competition with Semitool. The Novellus products allegedly infringing the Semitool patents are SABRE and SABRE xT. The SABRE and SABRE xT have all the

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[1] '310 Patent, Column 10, line 10 through Column 12, line 35; '708 Patent, Column 25, line 35 through Column 32, line 54.

[2] '708 Patent, Column 25, line 48; '310 Patent, Column 10, lines 16-17.

elements specified in the claims of the Semitool patents, including a head, a bowl, a processing chamber, and a wafer support. The only dispute is whether the relationship between the head and bowl of the Novellus products provide an equivalent of a "substantially enclosed" processing area or chamber.

B. Prior Proceedings

Under *Markman v. Westview Instruments, Inc.*, 517 U.S. 370 (1996), the district court construed the claim limitation "substantially enclosed" to mean:

> when the head is in a closed position over the bowl the head and bowl substantially enclose a processing chamber or space such that they form a seal which is sufficiently closed to permit the effective processing of a wafer using the gas phase of a processing chemical known in the art, regardless of whether the chemical to be used at any given time is in a gas or liquid state.[3]

Novellus moved for summary judgment on the grounds that infringement under the doctrine of equivalents was precluded by prosecution history estoppel. "Under this doctrine [of equivalents], a product or process that does not literally infringe upon the express terms of a patent claim may nonetheless be found to infringe if there is 'equivalence' between the elements of the accused products or process and the claimed elements of the patented invention." *Warner-Jenkinson Co. v. Hilton*

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[3] Northern District of California No. C-98-3089, Order of September 24, 1999 at 18.

Davis Chem. Co., 520 U.S. 17, 21 (1997). The doctrine of equivalents is constrained by the "reasonable limits" placed upon it by "prosecution history estoppel," 520 U.S. at 33, at least prior to *Festo*.

Prosecution history estoppel has traditionally provided that if a patent applicant amends a claim during prosecution for reasons of patentability, the specific subject matter disclaimed in the amendment may not be considered an equivalent for purposes of deciding infringement. 520 U.S. at 33. In *Festo*, however, the Federal Circuit recently held that the amendment of a claim limitation for a reason substantially related to patentability is a complete bar to any application of the doctrine of equivalents. 234 F.3d at 569.

At the district court, prior to *Festo*, the key dispute was whether prosecution history estoppel applied to the seal requirement. Semitool pointed out that the Aigo patent could not have had any seal because the processing area, above the bowl, was not at all enclosed. Processing occurred in the open. Semitool had not distinguished any prior art seals, and therefore did not surrender any equivalents to a seal.

By adding the requirement that the processing area be "substantially enclosed," Semitool merely surrendered patent coverage of devices with open or largely unenclosed processing areas, such as in Aigo. Here, such surrender was irrelevant because both SABRE and SABRE xT have a substantially enclosed processing space within the bowl, which is created by the relationship between the head and the bowl. As to the district court's requirement of a seal sufficient to allow gaseous processing,

Semitool presented evidence that the air flow into the Novellus devices was equivalent to that illustrated in the '708 patent. The air drawn through the SABRE and SABRE xT devices does not flow through or around the processing chamber.[4] The record contains evidence that gaseous processing, or any other processing step, would not be affected by this air.[5]

The district court rejected Semitool's argument, holding that the "substantially enclosed" language was added during prosecution to limit the positioning of the head and bowl and that Semitool was therefore precluded from arguing any equivalents related to the relationship between the head and the bowl. The district court refused to consider whether the SABRE and SABRE xT include an equivalent of the "substantially enclosed" processing chamber or space as claimed in the Semitool patents.

Semitool never obtained Federal Circuit review of that ruling. Instead, the Federal Circuit applied the "complete bar" holding from its recent decision in *Festo*, stating that because the claim at issue was narrowed for reasons relating to patentability, no range of equivalents whatsoever was available. 234 F.3d at 569, 576. The Federal Circuit did not address whether Semitool had surrendered the particular equivalent present in the Novellus devices, as would be the inquiry in a traditional application of prosecution history estoppel.

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[4] *See* Federal Circuit Appendix at A1972, A1979-A1980 (Testimony of Allan S. Myerson).

[5] *Id.*

II. REASONS FOR GRANTING THE PETITION

The Court has granted certiorari to decide the question presented here, the appropriate scope of the doctrine of equivalents, in *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, No. 00-1543 (cert. granted May 23, 2001). The Court's holding in *Festo* will determine whether the Federal Circuit's decision in this case was in error, and whether Semitool is entitled to further review.

A. The Outcome of This Case Depends on the Court's Decision in *Festo*

The Federal Circuit altered the historical balance between the doctrine of equivalents and prosecution history estoppel in *Festo*. The *Festo* holding expanded prosecution history estoppel and minimized the doctrine of equivalents. *Festo* held that the amendment of a claim limitation for a reason substantially related to patentability or not otherwise explained in the prosecution history is a complete bar to any application of the doctrine of equivalents. *Festo*, 234 F.3d at 569. Under *Festo*, where a claim is amended for a reason related to patentability, the patentee is not only precluded from claiming infringement by disclaimed subject matter, but the doctrine of equivalents is made completely unavailable – even as to unrelated equivalents. *Id.*

The Federal Circuit applied its controversial *Festo* holding in this case. Citing *Festo*, the Federal Circuit explained that "[w]hen an amendment narrows the scope of a claim for a reason relating to patentability, no range

of equivalents is available for that amended claim limitation." *Semitool, Inc. v. Novellus Sys., Inc.*, No. 00-1375, slip op. at 14 (Fed. Cir. June 8, 2001). The Federal Circuit did not examine whether the structure of SABRE and SABRE xT was disclaimed during prosecution of the Semitool patents. *Id.* But for *Festo*, it would have reviewed that issue. *See, e.g, Warner-Jenkinson*, 520 U.S. at 32.

The district court's decision was made before *Festo* changed the landscape of the doctrine of equivalents. The district court's grant of summary judgment was based on a narrower, but still very broad, application of prosecution history estoppel. The district court precluded application of the doctrine equivalents to any claim limitation involving the relative positions of the head and the bowl. Semitool did not specifically surrender any subject matter other than devices with open or largely unenclosed processing areas. Under traditional prosecution history estoppel, the district court should have been reversed.

Under *Festo*, Semitool's argument that it surrendered only unenclosed processing areas went unheard by the Federal Circuit. Appellate review under the traditional standard would have compelled a different outcome in this case. Thus, review is appropriate for all the reasons that supported review by the Court in *Festo*. Further, assuming the Court reverses *Festo*, this case presents the question of where, short of a complete bar, to draw the line.

B. The Court Should Hold This Petition Pending Its Important Ruling in *Festo*

The Court has regularly held petitions for certiorari pending the outcome of a plenary ruling. *See, e.g., Zalawadia v. Ashcroft*, ___ U.S. ___ (2001) (held pending decision in *Immigration and Naturalization Serv. v. St. Cyr*, 533 U.S. ___ (2001), then vacated and remanded for further consideration); *Immigration and Naturalization Serv. v. Chhun*, ___ U.S. ___ (2001) (held pending decision in *Zadvydas v. Davis*, 533 U.S. ___ (2001), then vacated and remanded for further consideration); *Campbell v. St. Tammany's Sch. Bd.*, ___ U.S. ___ (2001) (held pending decision in *Good News Club v. Milford Cent. Sch.*, 533 U.S. ___ (2001), then vacated and remanded for further consideration); *Collazo-Aponte v. United States*, ___ U.S. ___ (2001) (held pending decision in *Apprendi v. New Jersey*, 530 U.S. 466 (2000), then vacated and remanded for further consideration).

This is one of many cases recently decided by the Federal Circuit in reliance on its *Festo* decision. Other such cases include: *Mycogen Plant Science, Inc. v. Monsanto Co.*, 252 F.3d 1306, 58 U.S.P.Q. 2d 1891 (CA Fed. 2001); *Altech Controls Corp. v. Eil Instruments, Inc.*, No. 00-1216, unpublished (CA Fed. 5/02/01); *Lockheed Martin Corp. v. Space Sys./Loral, Inc.*, 249 F.3d 1314, 58 U.S.P.Q. 2d 1671 (CA Fed. 2001); *Insituform Techs., Inc. v. CAT Contracting, Inc.*, No. 99-1584, 00-1005, unpublished (CA Fed. 3/26/01) (petition for writ of certiorari filed June 25, 2001); *Litton Sys., Inc. v. Honeywell, Inc.*, 238 F.3d 1376, 57 U.S.P.Q. 2d 1653 (CA Fed. 2001) (petition for writ of certiorari filed April 23, 2001); and *Pioneer Magnetics, Inc.*

v. Micro Linear Corp., 238 F.3d 1341, 57 U.S.P.Q. 2d 1553 (CA Fed. 2001) (petition for writ of certiorari filed May 23, 2001). Given that the doctrine of equivalents is such a central issue in patent law, it is appropriate that the Court hold petitions for certiorari in cases relying on *Festo* until the underlying legal issues have been decided.

III. CONCLUSION

Semitool respectfully requests that the Court hold this petition for certiorari pending its decision in *Festo*. If the Court modifies the "complete bar" of the *Festo* decision, the grounds for the Federal Circuit ruling in this case will no longer be sound. In that event, Semitool requests that the Court review this case to determine the proper rule short of a complete bar, or vacate and remand to the Federal Circuit.

Respectfully submitted,

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UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

SEMITOOL, INC., Plaintiff-Appellant,

v.

NOVELLUS SYSTEMS, INC., Defendant-Appellee

2001 U.S. App. LEXIS 11986
June 8, 2001, Decided

NOTICE:

RULES OF THE FEDERAL CIRCUIT COURT OF APPEALS MAY LIMIT CITATION TO UNPUBLISHED OPINIONS. PLEASE REFER TO THE RULES OF THE UNITED STATES COURT OF APPEALS FOR THIS CIRCUIT.

DISPOSITION: Affirmed.

OUTCOME: The district court's order finding non-infringement was affirmed where prosecution history esstoppel precluded semiconductor patent holder from arguing that the airflow in the defendant's systems was equivalent to the "seal" required by plaintiff's patents.

JUDGES: Before MICHEL, LOURIE, and RADER, Circuit Judges.

OPINION BY: LOURIE

OPINION:

LOURIE, Circuit Judge.

DECISION

Semitool, Inc. appeals from the decision of the United States District Court for the Northern District of California granting Novellus Systems, Inc.'s motion for summary judgment that Novellus's SABRE and SABRE xT semiconductor wafer processing devices do not infringe Semitool's U.S. Patents 5,222,310 and 5,337,708. *Semitool, Inc. v. Novellus Sys.*, No. C-98-3089 (N.D.Cal. May 10, 2000). Because the district court did not err in granting summary judgment of noninfringement, we affirm.

DISCUSSION

A. Background

Semitool is the assignee of the '310 and '708 patents, which relate to an automated semiconductor wafer processing tool in which various chemical and electrochemical processes can be performed on a single wafer. *Semitool, Inc. v. Novellus Sys.*, No. C-98-3089, slip op. at 2 (N.D.Cal. Mar. 17, 2000) (order) (*"Semitool II"*). Wafer processing generally refers to the application of chemical substances to a silicon substrate to alter its surface properties. Typically, the surface of a semiconductor wafer is first oxidized to create an insulated layer of silicon dioxide. *Id.* Next, an etchant-resistant coating is applied to the surface of the wafer. A chemical etchant is then applied to the wafer to remove portions of the wafer not protected by the etchant- resistant coating, leaving a patterned layer of exposed silicon. *Id.* Finally, the exposed silicon layer is doped with another chemical substance that affects the electrical characteristics of the silicon, which

enables thin layers of a conducting metal to be electrochemically deposited (a process known as "plating") to establish electrical connections between various areas of the semiconductor. *Id.* These interconnections allow various transistors and other microelectronic devices located on the semiconductor to operate together, forming an integrated circuit. Although the claims of the patents at issue are not limited to any particular semiconductor processing operation, both patents principally focus on the chemical etching phase of wafer processing.

The wafer processing tool claimed in the '310 and '708 patents primarily comprises a movable head that is capable of "mating" with a processing bowl, which contains the chemical etchant used in processing the wafer. *Id.* at 3. The '310 patent contemplates the use of both liquid and gas chemical etchants, *see, e.g.*, '310 patent, col. 7, II. 3-42, while the '708 patent focuses exclusively on the use of the vapor phase of processing chemicals (particularly aqueous hydrofluoric acid), *see, e.g.*, '708 patent, col. 3, I. 49 to col. 4, I. 6. The movable head contains a structure for holding the wafer (the "wafer support" in the '708 patent) such that the wafer to be processed is positioned facing downward towards the bowl. *Semitool II* at 3. The processing device also has a pneumatic cylinder, which is used to raise and lower the processing head over the processing bowl such that wafers may be inserted and removed after processing. *Id.* at 4. The entire processing unit, consisting of the head, the bowl, and the pneumatic cylinder, is mounted inside a cabinet, which is designed to prevent contaminants from adversely affecting processing. *Id.*

Claims 1 and 3-5 of the '310 patent and claims 25, 32-37, 50, 55, and 56 of the '708 patent are at issue on appeal. Claim 1 of the '310 patent, which is representative of the claims of that patent and contains two limitations relevant to this appeal, reads as follows:

> 1. A wafer processing apparatus, comprising:
>
> a stationary frame;
>
> at least one processing base and a complementary processing head mounted to the frame, the processing base and complementary processing head being moveable relative to one another between a closed relative position forming a substantially closed processing space for containing processing fluids between the processing base and the processing head and an open relative position allowing transfer of wafers to and from the processing head;
>
> means for moving the processing base and complementary processing head relative to one another; and
>
> wafer transfer means on the frame for directing individual wafers between the processing head and one or more wafer carriers.

'310 patent, col. 10, ll. 10-27 (emphasis added). The '708 patent, which is a continuation-in-part of the application from which the '310 patent issued, is similar to the '310 patent.[1] However, the claims of the '708 patent do not

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[1] The claims of the '708 patent use the phrase "substantially enclosed processing chamber." However, neither party has argued that this phrase is different from the "substantially enclosed processing space" language in the claims of the '310

contain the "complementary processing head" limitation, and include an additional limitation relevant to this appeal. That limitation reads as follows:

> At least one wafer support for detachably supporting wafers thereon; said at least one wafer support allowing controlled motion of the wafer support and any wafer held therein, at least when the processing head is in said [sic] at least one processing position[.]

'708 patent, col. 27, II. 63-68 (emphasis added).

Novellus manufactures and sells two wafer processing tools, the SABRE and the SABRE xT systems (collectively, "the SABRE systems"). *Semitool II* at 11. Both machines perform the electrochemical deposition or plating processing step, in which a thin film of pure copper metal is applied onto the wafers during the manufacture of integrated circuits. *Id.* The electrochemical deposition occurs in a plating cell (characterized by Semitool as the "bowl"), which is comprised of a splash shield, an anode chamber, an exhaust tube inlet, and three concentric plating tanks. *Id.* The silicon wafers to be plated are held by a "clamshell" (characterized by Semitool as the "wafer support" in the '708 patent), which is attached by a shaft to a drive assembly (characterized by Semitool as the "head"). *Id.* The clamshell and the drive assembly are moved up and down over the plating cell to facilitate the loading and unloading of the silicon wafers to be processed. *Id.* Wafers are loaded into the plating cell through a "mail slot" on the side of the splash shield. *Id.* at 11-12. After

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patent. We therefore interpret these limitations identically, and refer only to the latter phrase throughout this opinion.

loading, the clamshell and drive assembly are lowered into a closed position until the wafer to be plated comes into contact with the liquid plating solution in the inner plating tank. *Id.* at 12. The drive assembly then spins the clamshell and wafer together at the surface of the plating solution. *Id.* Plating occurs when an electrical current travels through the plating solution and the wafer, thereby depositing copper ions in the plating solution onto the surface of the wafer in the form of pure copper metal. *Id.*

When the SABRE systems are in the closed position, there is no direct contact between the outer wall of the drive assembly and the interior walls of the plating cell. *Id.* Instead, an annular gap exists between the outer wall of the drive assembly and the interior wall of the plating cell, which is 0.25 inches wide in the SABRE machine and 0.815 inches wide in the SABRE xT machine. *Id.* Furthermore, the mail slot remains open throughout the plating process. The combined area of the annular gap and the mail slot opening amounts to 19.2 square inches in the SABRE machine and 38.6 square inches in the SABRE xT machine. *Id.* at 13.

Semitool sued Novellus in the United States District Court for the Northern District of California, alleging that Novellus's SABRE systems infringed the '310 and '708 patents. *Id.* at 1. After conducting a *Markman* hearing, the district court interpreted the "substantially enclosed processing space" limitation of both patents to require a "seal" created by the head and the bowl that is "sufficiently closed to permit the effective gas processing of a wafer using the gas phase of a processing chemical known in the art, regardless of whether the chemical to

be used is in a gas or liquid state." *Semitool, Inc. v. Novellus Sys.*, No. C-98-3089, slip op. at 19 (N.D.Cal. Sept. 24, 1999) (order) ("*Semitool I*"). Given its construction of the "substantially enclosed" limitation, the court construed the "complementary processing head" limitation in the '310 patent to require that "the head and bowl form a single component when in the closed position." *Id.* at 20. Finally, the court interpreted the phrase "wafer support for detachably supporting wafers thereon" in the claims of the '708 patent to be a means-plus-function limitation under 35 U.S.C. § 112, p. 6, and thus limited to the corresponding structure disclosed in the specification (*viz.*, a plate having a plurality of fingers that grip the wafer at its peripheral edge) and any equivalents thereof. *Id.* at 24.

Based on its claim construction, the court granted Novellus's motion for summary judgment of noninfringement of both the '310 and '708 patents. *Semitool II* at 23. The court determined that the opening defined by the mail slot and the annular gap between the drive assembly and the plating cell in the SABRE systems precludes a finding that those devices have a "seal" that satisfies the "substantially enclosed processing chamber" limitation. *Id.* at 14-15. The court also found that Semitool failed to establish a genuine issue of material fact that the SABRE systems are capable of effective gas processing. *Id.* at 21. Finally, the court found that prosecution history estoppel precluded Semitool from arguing that the air flow in the SABRE systems is equivalent to the "seal" required by both patents. *Id.* at 22-23.

B. Standards of Review

Summary judgment is appropriate "if the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no genuine issue as to any material fact and that the moving party is entitled to a judgment as a matter of law." Fed.R.Civ.P. 56(c). "The evidence of the nonmovant is to be believed, and all justifiable inferences are to be drawn in his favor." *Anderson v. Liberty Lobby, Inc.*, 477 U.S. 242, 255, 91 L.Ed.2d 202, 106 S.Ct. 2505 (1986). We review a district court's grant of a motion for summary judgment *de novo. Ethicon Endo-Surgery, Inc. v. United States Surgical Corp.*, 149 F.3d 1309, 1315, 47 USPQ2d 1272, 1275 (Fed.Cir.1998).

A determination of infringement requires a two-step analysis. *Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1476, 45 USPQ2d 1498, 1500 (Fed.Cir.1998). "First, the claim must be properly construed to determine its scope and meaning. Second, the claim as properly construed must be compared to the accused device or process." *Id.* (quoting *Carroll Touch, Inc. v. Electro Mech. Sys., Inc.*, 15 F.3d 1573, 1576, 27 USPQ2d 1836, 1839 (Fed.Cir.1993)). Claim construction is an issue of law, *Markman v. Westview Instruments, Inc.*, 52 F.3d 967, 970-71, 34 USPQ2d 1321, 1322 (Fed.Cir.1995) (en banc), *aff'd*, 517 U.S. 370, 134 L.Ed.2d 577, 116 S.Ct. 1384 (1996), that we review *de novo, Cybor Corp. v. FAS Techs., Inc.*, 138 F.3d 1448, 1456, 46 USPQ2d 1169, 1172 (Fed.Cir.1998) (en banc). "Whether certain claim language invokes 35 U.S.C. § 112, p. 6 is an exercise of claim construction and is therefore a question of law, reviewable *de novo* by this court." *Personalized Media Communications v. Int'l Trade*

Comm'n, 161 F.3d 696, 702, 48 USPQ2d 1880, 1886 (Fed.Cir.1998). A determination of infringement, whether literal or under the doctrine of equivalents, is a question of fact. *Bai v.. L & L Wings, Inc.*, 160 F.3d 1350, 1353, 48 USPQ2d 1674, 1676 (Fed.Cir.1998).

C. Claim Construction

1. The "Substantially Enclosed" Limitation

Semitool argues that the phrase "substantially enclosed" simply refers to the ability to contain processing fluids within the head and the bowl depending upon the processing fluid used, and that it distinguished the prior art (*i.e.*, the Aigo reference) on that ground during prosecution. Semitool contends that the district court erred by requiring that the head and the bowl form a "seal," as the specification of the '708 demonstrates that a seal is required only in a preferred embodiment of the invention.

Novellus responds that the only embodiment of the claimed wafer processing tool set forth in both patents has a processing chamber that is sufficiently sealed to allow pressurization and to prevent ambient air flow into the chamber, and that the phrase "substantially enclosed processing space" must therefore be limited to that embodiment. Novellus also argues that Semitool limited its claims during prosecution to require that the wafer processing tool be sufficiently "sealed" to enable effective gas processing. Finally, Novellus contends that Semitool's process-dependent interpretation of the "substantially enclosed" limitation relies entirely on extrinsic evidence and has no support in the intrinsic record.

In interpreting claims, a court "should look first to the intrinsic evidence of record, *i.e.*, the patent itself, including the claims, the specification, and, if in evidence, the prosecution history." *Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1249, 39 USPQ2d 1573, 1577 (Fed.Cir.1996). When the meaning of a term used in a claim is sufficiently clear from its definition in the patent specification, that meaning shall apply. *Multiform Desiccants, Inc. v. Medzam, Ltd.*, 133 F.3d 1473, 1477, 45 USPQ2d 1429, 1432 (Fed.Cir.1998); *Intellicall, Inc. v. Phonometrics, Inc.*, 952 F.2d 1384, 1388, 21 USPQ2d 1383, 1387 (Fed.Cir.1992). Furthermore, "the prosecution history limits the interpretation of claim terms so as to exclude any interpretation that was disclaimed during prosecution." *Southwall Techs., Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1576, 34 USPQ2d 1673, 1676 (Fed.Cir.1995) (citations omitted).

We agree with Novellus that the district court properly construed the "substantially enclosed processing space" limitation to require a "seal" created by the head and the bowl that is sufficiently closed to permit the effective gas processing of a wafer using the gas phase of a processing fluid. Nothing in the plain language of the claims sheds any light on the meaning of the phrase "substantially enclosed." However, during the prosecution of the '310 patent, Semitool explained the significance of the "substantially enclosed" limitation when it distinguished the Aigo prior art reference, stating that:

> [Claim 1] has been amended to recite that the complementary processing head and processing base define a substantially enclosed processing space when in the closed relative position. This

> allows the processing space to contain the gaseous or liquid processing chemicals. The Aigo reference has no ability to enclose the wafer and cannot process effectively using gases."

'310 patent file history, Paper No. 8 at 5 (emphasis added). Although Semitool argues that it only disclaimed coverage for wafer processing tools that process wafers outside of the region defined by the head and the bowl, that interpretation would require us to ignore its statement requiring the tool to be capable of effective gas processing – a statement that is divorced from any concept of "containing" the wafer and processing chemical in any particular processing space. We therefore find that Semitool expressly disclaimed coverage under the '308 patent of any wafer processing tool that cannot effectively utilize the gas phase of a processing chemical. *See Southwall,* 54 F.3d at 1576, 34 USPQ2d at 1676.

We reach the same conclusion with respect to the "substantially enclosed" limitation in the '708 patent. "When multiple patents derive from the same initial application, the prosecution history regarding a claim limitation in any patent that has issued applies with equal force to subsequently issued patents that contain the same claim limitation." *Elkay Mfg. Co. v. Ebco Mfg. Co.,* 192 F.3d 973, 980, 52 USPQ2d 1109, 1114 (Fed.Cir.1999) (citing *Jonsson v. The Stanley Works,* 903 F.2d 812, 817-18, 14 USPQ2d 1863, 1863-69 (Fed.Cir.1990)). Thus, Semitool's relinquishment of subject matter during prosecution of the '310 patent applies with equal force to the '708 patent.

Moreover, the specification of the '708 patent expressly defines the "substantially enclosed" limitation as follows:

> The head 12 is loaded with wafer 20 which is held in position by the wafer holder. The head is positioned in sealing relationship with the bowl 14 or otherwise suitably adjusted to confine the processing chamber against drafts and other substantial leakages which might affect the homogeneous vapor phase which is being presented for contacting and etching the processed surface of the wafer 20.

'708 patent, col. 9, II. 32-39 (emphasis added). We have repeatedly stated that "claims must be read in view of the specification. . . . Usually, it is dispositive; it is the single best guide to the meaning of a claim term." *Vitronics*, 90 F.3d at 1582, 39 USPQ2d at 1577. Thus, although the claims of the '708 patent do not require an air-tight seal, the specification makes clear that they require a "seal" that is sufficient to prevent "drafts and substantial leakages" that might affect the ability of the processing chemical to operate in the gas phase. We therefore conclude that the district court correctly interpreted the "substantially enclosed" limitation in the '310 and '708 patents to require a "seal" created by the head and the bowl that is sufficiently closed to permit the effective gas processing of a wafer using the gas phase of a processing fluid, regardless whether the chemical to be used is in a gas or liquid state.

2. The "Complementary Processing Head" Limitation

Semitool also argues that the district court erred by construing the "complementary base head" limitation in the '310 patent to require that the head and the bowl form a single unitary structure when in the closed position because neither the ordinary meaning of the word "complementary," the specification, nor the prosecution history support that interpretation. Novellus responds that Semitool did not raise this argument before the district court and therefore waived it on appeal.

Even assuming that Semitool failed to argue the meaning of the "complementary processing head" limitation to the district court, the court did construe that limitation, and in light of the continued vitality of the patent and the public interest in clarifying the scope of the claims, we exercise our discretion to review the district court's construction of that limitation. We agree with Semitool that the district court erred in its interpretation. It is undisputed, and in fact was so determined by the district court, that the head and the bowl in both patents do not form a "gas-tight" seal. *Semitool I* at 19. Thus, the head and the bowl cannot be said to form a "single component" when in the closed position. Rather, as taught in the '310 and '708 patents, the head is only "complementary" to the extent that, when lowered into the closed position, it forms a seal with the bowl that is sufficiently closed to permit effective gas processing. We therefore interpret the "complementary processing head" limitation to be synonymous with the "substantially closed" limitation, which does not require the head and

the bowl to form a single component when in the closed position.

3. The "Wafer Support" Limitation

Finally, Semitool argues that the district court erred by construing the phrase "wafer support for detachably supporting wafers thereon" in the '708 patent to be a means-plus-function limitation under 35 U.S.C. § 112, ¶ 6 because that phrase is a generic expression for a variety of well-known physical devices used to hold or grasp a wafer and release it. Novellus responds that the phrase is purely functional, and that because the claims do not recite any specific structure for performing that function, the district court properly construed that term to be a means-plus-function limitation.

The failure to use the word "means" creates a presumption that § 112, ¶ 6 does not apply, which can be rebutted by both intrinsic evidence and any relevant extrinsic evidence. *Personalized Media*, 161 F.3d at 703, 48 USPQ2d at 1886 (citing *Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1213, 48 USPQ2d 1010, 1016 (Fed.Cir.1998)). "In deciding whether [the] presumption has been rebutted, the focus remains on whether the claim as properly construed recites sufficiently definite structure to avoid the ambit of § 112, ¶ 6." *Id.* (citing *Sage Prods., Inc. v. Devon Indus., Inc.*, 125 F.3d 1420, 1427- 28, 44 USPQ2d 1103, 1109 (Fed.Cir.1999)).

We agree with Semitool that the district court erred in construing the phrase "wafer support for detachably supporting wafers thereon" to be a means-plus-function limitation. The "wafer support" limitation does not use

the word "means," and therefore this limitation is presumed not to invoke § 112, ¶ 6. *Id.* Furthermore, none of the intrinsic or extrinsic evidence rebuts this presumption because the term "support" is a sufficient recitation of structure. The word "support" is a well-known term in the mechanical arts for a number of objects capable of providing some type of foundation for another object. *See* Knight's American Mechanical Dictionary 2455 (1876) (defining "structure" as "[a] term of very general import. A stand, frame, or bed for an . . . apparatus, implement, tool"). The fact that the term "support" does not specifically evoke a particular structure does not change the fact that it does connote structure. *See Greenberg v. Ethicon Endo-Surgery,* 91 F.3d 1580, 1583, 39 USPQ2d 1783, 1786 (Fed.Cir.1996) (stating that a claim term "need not call to mind a single well-defined structure" to fall within the ambit of § 112, ¶ 6, and that the relevant inquiry is whether the claim term "has a reasonably well understood meaning in the art"). We conclude that the "wafer support" limitation conveys sufficient structure to preclude the application of § 112, ¶ 6, and therefore interpret that limitation to mean any device capable of both holding or grasping a semiconductor wafer and releasing it at some later time.

D. Infringement

With respect to infringement, Semitool argues that even under the district court's claim construction, its grant of summary judgment of noninfringement cannot stand. Semitool contends that the air being drawn into the plating cell through the annular gap in the SABRE

systems forms a fluid "seal" that satisfies the "substantially enclosed" limitation. Semitool also argues that tests performed by its experts created a factual dispute as to whether the SABRE systems can effectively process wafers using the vapor phase of a processing chemical.

Novellus responds that the air flow in the SABRE systems cannot satisfy the "substantially enclosed" limitation because the plain language of the claims requires that the head and the bowl form the "seal" in the processing chamber. Novellus also contends that prosecution history estoppel precludes a finding that the air flow in its SABRE systems infringes under the doctrine of equivalents. Finally, Novellus argues that Semitool did not establish a genuine issue of material fact as to whether the SABRE systems are capable of effective gas processing because it failed to present adequate evidence regarding repeatability, uniformity, and low contamination – qualities of wafer processing that its patents taught were crucial.

We agree with Novellus that the district court properly granted summary judgment of noninfringement. The claims of both patents plainly require that the "substantially enclosed processing space" be formed by the head and the bowl. '310 patent, col. 10, II. 12-17; '708 patent, col. 27, II. 54-58. The structure most closely corresponding to the head and the bowl in the SABRE systems is the plating cell and the drive assembly, and therefore it is these components, and not air flow, that must form the required "seal" in order to literally satisfy the "substantially enclosed" limitation. Consequently, the air flow in the accused devices cannot literally satisfy that limitation.

Neither does the air flow in the SABRE systems satisfy the "substantially enclosed" limitation under the doctrine of equivalents. It is undisputed that that limitation was added during prosecution of the '310 patent to overcome the Aigo reference. When an amendment narrows the scope of a claim for a reason relating to patentability, no range of equivalents is available for that amended claim limitation. *Festo Corp. v. Shoketsu Kinzoku Kogyo Kabushiki Co.*, 234 F.3d 558, 569, 576, 56 USPQ2d 1865, 1872, 1878 (Fed Cir.2000) (en banc). Thus, because the "substantially enclosed" limitation was added for a reason relating to patentability, Semitool is barred by prosecution history estoppel from arguing that anything other than the head and the bowl can form a "seal" satisfying that limitation.

Semitool is similarly barred from obtaining any range of equivalents for the "substantially enclosed" limitation in the '708 patent. As indicated above, the prosecution history of the '310 patent is also relevant to the '708 patent, *see Elkay*, 192 F.3d at 981, 52 USPQ2d at 1115, and thus Semitool's addition of the "substantially enclosed" limitation during prosecution of the '310 patent for a reason relating to patentability precludes the application of the doctrine of equivalents to that same limitation in the '708 patent, *see Festo*, 234 F.3d at 569, 576, 56 USPQ2d at 1872, 1878. We therefore conclude that the air flow in the SABRE systems does not satisfy the "substantially enclosed" limitation either literally or under the doctrine of equivalents.

Moreover, as stated above, Semitool made clear in its prosecution that the "substantially enclosed" limitation requires a "seal" created by the head and the bowl that is

sufficiently closed to permit effective gas processing. In that regard, Semitool expressly defined effective gas processing in the specification of the '708 patent as entailing four elements: (1) a high etch rate; (2) uniformity; (3) repeatability; and (4) low contamination. '708 patent, col. 4, II. 1-6.[2] As noted by the district court, the tests performed by Semitool's experts only establish a genuine issue of material fact that high etch rates could be achieved in the SABRE systems when using the gas phase of a processing fluid. The district court determined that Semitool only offered speculative evidence of uniformity, and that it presented no evidence whatsoever regarding repeatability and contamination. *Semitool II* at 22. We find no error in the court's determination that Semitool failed to establish a genuine issue of material fact that the SABRE systems are capable of effective gas processing, and therefore conclude that those devices do not satisfy the "substantially enclosed" limitation of both patents.

Given our affirmance of the district court's grant of summary judgment of noninfringement on the basis that Novellus's SABRE systems do not satisfy the "substantially enclosed" limitation of either patent at issue, we need not address whether those devices satisfy the "complementary processing head" and "wafer support" limitations of the '708 patent under their proper constructions set forth above.

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[2] With respect to the '310 patent, because that patent has the same parent as the '708 patent and the parties have not argued that any meaningful difference exists between the "substantially enclosed" limitations in those patents, the same infringement analysis applies.

We have considered Semitool's remaining arguments and find them to be unpersuasive.

CONCLUSION

Because the district court did not err in granting summary judgment that the '310 and '708 patents were not infringed, we affirm.

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

SEMITOOL, INC., a Montana corporation, Plaintiff, v. NOVELLUS SYSTEMS, INC., a California corporation, Defendant.	No. C-98-3089 DLJ ORDER (FILED MAR 17 2000)

On February 18, 2000, the Court heard argument on Novellus Systems, Inc.'s motion for summary judgment on the infringement claim of Semitool. Keith V. Rockey and William E. Trautman appeared on behalf of plaintiff; Bruce D. Kuyper and Samuel K. Lu appeared for defendant. Having considered the arguments of counsel, the papers submitted, the applicable law, and the record in this case, the Court hereby GRANTS defendant's motion for summary judgment.

I. BACKGROUND

A. Factual Background and Procedural History

Semitool, Inc. (Semitool) filed an action in this Court on August 10, 1998 against Novellus Systems, Inc. (Novellus). The suit alleges that the SABRE equipment, which is manufactured by Novellus for processing substrates such as semiconductor wafers, infringes United States Patents 5,222,310 (the '310 patent) and 5,377,708 (the '708 patent). The specific claims at issue are claims 25, 32-37, 50, and 55-56 of the '708 patent and claims 1 and 3-5 of

the '310 patent. Semitool owns the rights to the '310 and '708 patents. Having alleged willful infringement, Semitool seeks a permanent injunction, treble damages, costs and attorney's fees, and pre- and post-judgment interest.

In answer, Novellus alleges the affirmative defenses of invalidity and failure to mark as required by 35 U.S.C. § 287. As a counterclaim, Novellus seeks a declaratory judgment of noninfringement and invalidity for failure to comply with the requirements of 35 U.S.C. §§ 102, 103, and 112.

Both the '708 and '310 patents are directed at the design of an apparatus in which the processing steps for manufacturing semiconductor wafers are carried out. Semitool is a company that manufactures tools used in the processing of wafers.

A semiconductor commonly begins life as a silicon wafer that undergoes a series of chemical and electrochemical processes. Although the steps may occur in different orders and may be repeated, the following explanation of the steps is somewhat typical.

The first step involves oxidizing the surface of the silicon to create an insulated layer. In the next step a patterned layer is formed over the insulated layer so that only select portions of the insulated layer are exposed. An etchant is then applied to remove the exposed portions of the insulated layer. The exposed surface of the silicon is doped with a chemical substance that affects the electrical characteristics of the silicon. In the next phase, a conducting metal is electrochemically deposited to establish electrical connections between various areas of the

semiconductor. In between steps, the wafer may be stripped and cleaned to remove contaminants that might adversely affect subsequent processes.

Different processes have different engineering concerns. When etching a wafer using the highly corrosive vapor of hydrofluoric acid, the design must guard against contamination from the ambient air while also shielding equipment outside the vapor bath from the corrosive effects of the vapor. By comparison, when using liquid processing, the primary concern is to protect the liquid and the wafer from contaminants.

The '708 and '310 patents are directed at a tool for single-wafer processing. The tool is an automated, multistation wafer processor tool in which various chemical and electrochemical processes can be carried out.

The '708 patent sets forth an automated wafer processing tool which consists primarily of a movable head that is capable of "mating" with a processing bowl. The movable head contains a structure for holding the wafer such that the wafer face to be processed is positioned facing downward into the bowl. This wafer support is mounted on a drive shaft that is connected to a motor such that the wafer support can be rotated.

The processing bowl, in the preferred embodiment, contains a pool of chemical used to process the wafer. For example, if the process to be performed is etching, the chemical might be hydrofluoric acid (HF) in a form that gives off vapors that etch the surface of the wafer. A system for supplying and recycling the processing chemical is part of the bowl's design. The bowl can also be

designed with ports through which drying gases can be introduced into the bowl.

A pneumatic cylinder is provided to raise and lower the processing head over the processing bowl so that wafers may be inserted to be processed and removed after processing.

The entire processing unit, consisting of the head, the bowl, and the pneumatic cylinder, is mounted inside a cabinet. This cabinet is designed so that the surrounding environment can be controlled for contaminants, including particulates, humidity, and other elements in the ambient air that can adversely affect processing. The cabinet can be designed to contain multiple processing chambers. A robotic transfer unit may be used to move wafers from a wafer inventory to a processing chamber and between processing chambers.

The '310 patent discloses a similar processing unit. This patent reveals a chamber that is defined by a processing base and a complimentary processing head. The head and base are movable relative to each other.

On August 27, 1999, the Court held a claim construction hearing to determine the meaning of the relevant claim language of the '708 and '310 patents. At the claim construction hearing, one of the disputes between the parties concerned the interpretation of the phrase "substantially enclosed processing chamber," as used in claims 25 and 50 of the '708 patent, and the related phrase "substantially enclosed processing space," as used in claim 1 of the '310 patent. Both parties agreed that this language limited all the claims at issue in the suit.

The relevant element disclosed in claims 25 and 50, which use identical language, recites:

> at least one processing head mounted for controlled movement between at least one processing position wherein the processing head is in an operative relationship with the processing bowl to define a substantially enclosed processing chamber, and at least one loading position wherein the processing head is removed from the processing bowl for loading or unloading wafers from at least one processing head.

The relevant claim language for claim 1 of the '310 patent recites the following element:

> at least one processing base and a complementary processing head mounted to the frame, the processing base and complementary processing head being moveable relative to one another between a closed relative position forming a substantially enclosed processing space for containing processing fluids between the processing base and the processing head and an open relative position allowing transfer of wafers to and from the processing head.

Novellus contended that the phrases "substantially enclosed processing chamber" and "substantially enclosed processing space" must be interpreted as requiring an "essentially gas-tight processing space" that is isolated from the surrounding environment. Semitool argued that "substantially" means that the processing head's relationship to the processing bowl is such that the chamber is nearly completely surrounded, but not entirely.

On September 24, 1999, the Court issued its order construing the relevant claims. In the Order of September 24, 1999, the Court specifically addressed the appropriate scope and meaning of the phrases "substantially enclosed processing chamber" and "substantially enclosed processing space." In determining the proper meaning of these phrases, the Court first noted that when the '310 patent was before the patent examiner, the examiner initially rejected the claims as obvious over the Aigo patent, and that this was the reason Semitool added the "substantially enclosed" phrase to its claims. The Court found that:

> The Aigo reference consists of a base and a wafer holder that sits on the base and delivers the wafer to the base for processing. In the examiner's view, the Aigo reference rendered obvious the design of a head over a base. '310 file wrapper at 0000101. To overcome this objection the applicant added the phrase "substantially enclosed" to the claim language. . . . In justifying this addition as sufficient to overcome the objection, the applicant contended that the Aigo device was one in which the fluid was designed to be pumped up through the base to the wafer surface and then to overflow the walls of the base. Thus Aigo did not contemplate keeping the fluid to be used confined within a space created by the combination of head and base. In contrast, the '310 apparatus was designed to contain the fluid in use inside the processing space. According to the applicant, the position of the head over the chamber in the '310 design "allows the processing space to contain the gaseous or liquid processing fluids. The Aigo reference has no ability to enclose the

> wafer and cannot process effectively using gases." Lu Decl., Ex. L at 5. The applicant also contended that an advantage of an enclosed space was that it minimized the risk that the processing fluid would be contaminated. '310 file wrapper at 0000098; Lu Decl., Ex. L at 5. The specification of the '708 patent also emphasizes the use of an enclosed space to shield processing fluids from contaminants. '708 patent, col. 4.

Order of September 24, 1999 at 14-15. The Court then determined that the proper construction of the phrase "substantially enclosed processing chamber" or "space" is that:

> when the head is in a closed position over the bowl the head and bowl substantially enclose a processing chamber or space such that they form a seal which is sufficiently closed to permit the effective processing of a wafer using the gas phase of a processing chemical known in the art, regardless of whether the chemical to be used at any given time is in a gas or liquid state.

Order of September 24, 1999 at 18.

Based on this claim construction order, Novellus moved for summary judgment of non-infringement on December 17, 1999. Semitool filed an opposition on January 24, 2000.

B. Legal Standard

The Federal Rules of Civil Procedure provide for summary adjudication when "the pleadings, depositions, answers to interrogatories, and admissions on file, together with the affidavits, if any, show that there is no

genuine issue as to any material fact and that the party is entitled to a judgment as a matter of law." Fed. R. Civ. P. 56(e).

Procedural matters not unique to patent law are decided by applying the law of the relevant regional circuit. *See Transmatic, Inc. v. Gulton Indus., Inc.*, 53 F.3d 1270, 1278 (Fed. Cir. 1995).

In a motion for summary judgment, initially it is the moving party's burden to establish that there is "no genuine issue of material fact and that the moving party is entitled to judgment as a matter of law." Fed. R. Civ. P. 56(c); *British Airways Board v. Boeing Co.*, 585 F.2d 946, 951 (9th Cir. 1978). Subsequently, "[i]f the party moving for summary judgment meets its initial burden of identifying for the court those portions of the materials on file that it believes demonstrates the absence of any genuine issues of material fact," the burden of production then shifts so that "the non-moving party must set forth, by affidavit or as otherwise provided in Rule 56, '*specific facts* showing that there is a genuine issue for trial.' " *T.W. Elec. Service, Inc. v. Pacific Elec. Contractors Ass'n*, 809 F.2d 626, 630 (9th Cir. 1987) (citing *Celotex Corp. v. Catrett*, 477 U.S. 317 (1986)); *Kaiser Cement Corp. v. Fischbach & Moore, Inc.*, 793 F.2d 1100, 1103-04 (9th Cir. 1986).

"To prove literal [patent] infringement, the patentee must show that the accused device contains every limitation in the asserted claims. If even one limitation is missing or not met as claimed, there is no literal infringement." *Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1211 (Fed. Cir. 1998) (citations omitted). In the absence of a genuine issue of material fact, summary

judgment of no literal infringement is properly granted if no reasonable jury could determine that the accused device meets every limitation of the properly construed claims. *See Gentry Gallery, Inc. v. Berkline Corp.*, 134 F.3d 1473, 1476 (Fed. Cir. 1998).

If some limitations of the claim are not literally satisfied, infringement may be found in appropriate circumstances under the doctrine of equivalents. *See Pennwalt Corp. v. Durand-Wayland, Inc.*, 833 F.2d 931, 934-35 (Fed. Cir. 1987). "Under the doctrine of equivalents, infringement may be found (but not necessarily) if an accused device performs substantially the same overall function or work, in substantially the same way, to obtain substantially the same overall result as the claimed invention." *Id.* at 934. "The doctrine of equivalents must be applied to individual elements of the claim, not to the invention as a whole." *Warner-Jenkinson Co. v. Hilton Davis Chem. Co.*, 520 U.S. 17, 29 (1997).

Like literal infringement, the issue of patent infringement under the doctrine of equivalents can be amenable to summary judgment. "Where the evidence is such that no reasonable jury could determine two elements to be equivalent, district courts are obliged to grant partial or complete summary judgment." *Id.* at 39 n.8.

The application of the doctrine of equivalents to a claimed element may be limited by prosecution history estoppel. The application of prosecution history estoppel is a question of law. *See Loral Fairchild Corp. v. Sony Corp.*, 181 F.3d 1313, 1323 (Fed. Cir. 1999), *petition for cert. filed*, 68 U.S.C.W. 3274 (U.S. Oct. 14, 1999) (No. 99-653). "Prosecution history estoppel acts as one check on application

of the doctrine of equivalents, by precluding a patentee from regaining, through litigation, coverage of subject matter relinquished during prosecution of the application for the patent." *Wang Lab., Inc. v. Mitsubishi Elecs. Am., Inc.*, 103 F.3d 1571, 1577-78 (Fed. Cir. 1997) (citations omitted). Prosecution history estoppel applies to subject matter surrendered as a result of amendments to overcome patentability rejections, or as a result of argument to secure the allowance of a claim. *See Loral Fairchild*, 181 F.3d at 1322. "When a claim has been narrowed by amendment for a 'substantial reason related to patentability,' such as to avoid a prior art rejection, the patentee may not assert that the surrendered subject matter is within the range of equivalents." *Regents of the Unv. of Calif. v. Eli Lilly and Co.*, 119 F.3d 1559, 1573 (Fed. Cir. 1997). A prosecution history estoppel for a claim limitation in an issued patent applies with equal force to a subsequently issued patent that is derived from the same patent application and that contains the same claim limitation. *See Elkay Mfg. Co. v. Ebco Mfg. Co.*, 192 F.3d 973, 981 (Fed. Cir. 1999).

II. DISCUSSION

Novellus argues that based upon the Court's construction of the claim language "substantially enclosed processing chamber" and "substantially enclosed processing space," the Court should enter summary judgment in favor of Novellus. For the purposes of this summary judgment motion, the Court must determine if there is a genuine issue of material fact as to whether Novellus' accused products, the SABRE and SABRExT, literally or under the doctrine of equivalents, infringe

upon the Court's interpretation of the relevant language that "when the head is in a closed position over the bowl the head and bowl substantially enclose a processing chamber or space such that they form a seal which is sufficiently closed to permit the effective processing of a wafer using the gas phase of a processing chemical known in the art." Order of September 24, 1999.

A. The SABRE System

Novellus' SABRE system is an automated machine that applies a thin film of extremely pure copper metal onto silicon wafers during the manufacture of integrated circuits, commonly known as computer chips. This process is known as electrochemical deposition or plating.

Novellus has manufactured and sold two versions of the SABRE system, the original SABRE and the SABRExT. *See* Evan Patton Decl. ¶ 2. The original SABRE is capable of processing only 200 mm size wafers. *See* Patton Decl. ¶ 2. The SABRExT is capable of processing either 200 mm or 300 mm size wafers. *See* Patton Decl. ¶ 2.

For the purposes of this motion, Novellus provides a basic explanation of how the process of electrochemical deposition occurs in the two versions of SABRE system, and the Court notes that Semitool accepts this explanation also for the purposes of this motion. *See* Samuel Lu Decl. Ex. M at ¶ 14-21 (George R. Tynan Decl.), Ex. L. at ¶ 33-40 (Douglas L. Peltzer Decl.), and Ex. J (illustrations of the process). First, electrochemical deposition occurs in the plating cell of the SABRE system (characterized by Semitool as "the bowl"). The plating cell comprises a splash shield, an anode chamber, an exhaust tube inlet,

and three concentric tanks. Silicon wafers to be plated are held by the "clamshell", which is attached by a shaft to the drive assembly (characterized by Semitool as "the head").

The clamshell and the drive assembly are moved up and down above the plating cell. In the up or "loading position," wafers are loaded onto and unloaded from the clamshell through the "mail slot" on the side of the splash shield. Once a wafer has been loaded, the clamshell is lowered until the wafer touches the top of the liquid plating solution in the inner plating tank. This is the closed or "plating position." The drive assembly then spins the clamshell and wafer together at the surface of the plating solution. Plating occurs when an electrical current travels through the plating solution and the wafer, depositing copper ions in the plating solution onto the surface of the wafer as pure copper metal.

In the closed position, there is no direct contact between the outer wall of the drive assembly (the head) and the interior walls of the plating cell (the bowl). Instead, there is an annular gap between the outer wall of the drive assembly and the interior wall of the plating cell. This annular gap is .25 inches in the SABRE version and .815 inches in the SABRExT version. *See* Patton Decl. ¶¶ 8-9.

B. Novellus' Summary Judgment Arguments

Novellus makes two arguments as to why the SABRE system does not infringe the "substantially enclosed" claim language. First, in a closed position, Novellus argues that the head and the bowl do not form a "seal."

Second, Novellus asserts that due to the annular gap between the head and the bowl and the mail slot opening, effective gas processing is impossible within the area defined by the SABRE system.

1. No seal

In support of its argument that no "seal" exists, Novellus provides that the combined area of the annular gap and the mail slot openings amounts to 19.2 square inches for the SABRE version and 38.6 square inches for the SABRExT version. *See* Patton Decl. ¶¶ 8-9. Novellus contends that Semitool has admitted that the SABRE system "does not include a mechanical seal performed by direct contact between the head and processing bowl." Lu Decl. Ex. D (Semitool's Response to Novellus' Request for Admission No. 19).

Novellus next argues that not only does the SABRE system have gaps allowing ambient air to enter the processing chamber, the system has an exhaust system designed to draw air into the plating cell (the bowl). *See* Lu Decl. Ex. D (Semitool's Response to Novellus' Request for Admission No. 22). Novellus presents the findings of Professor George Tynan who states that air passes through the plating cell (the bowl) at 40.7 cubic feet per minute in the SABRE version and at 45.4 cubic feet per minute in the SABRExT version. *See* Tynan Decl. ¶¶ 24-25. Novellus claims that this air flow is equivalent to exchanging all of the air in an 8 foot high, 8 foot long, and 8 foot wide room every 13 minutes for SABRE version and every 11 minutes for the SABRExT version. Novellus argues that although the Court has found that

"some leakage is permitted," that this amount of air flow cannot qualify as "some leakage."

Semitool admits that there is no mechanical seal between the head and the bowl in the SABRE system, however, Semitool argues that a mechanical seal is not required by the Court's claim construction order and is directly inconsistent with the specification of its patents. Semitool points out that there are several different kinds of seals between two surfaces besides direct contact. For example, Semitool asserts that the flow of air can be controlled by means of a tortuous path. In the case of the SABRE system, Semitool specifically contends that the air flowing into the plating cell (the bowl) constitutes a containment mechanism or seal keeping the fluid (or hypothetically gas) to be used within the processing space. *See* Polit Decl. Ex. 4 (335-37) and Ex. 5 (365).

In its reply brief, Novellus points out that Semitool's position that the air flow constitutes the seal admits that the head and the bowl do not form the seal. Novellus further asserts that if the exhaust is turned off removing the air flow, the head and the bowl are in a closed position with no seal at all.

The Order of September 24, 1999 directly states that the head and bowl must form a seal. The evidence presented to the Court unquestionably establishes that the plating cell (the bowl) and the drive assembly (the head) in the SABRE system do not form a seal. There is an annular gap in both versions plus an opening defined by the mail slot. At the February 18, 2000 hearing on Novellus' motion for summary judgment, Semitool conceded that the head and bowl do not form a seal. Instead,

Semitool made clear that its argument is that it is the air flowing within the area defined by the head and the bowl that acts as a seal in the SABRE system. The Court finds that the head and the bowl in the SABRE system do not form a seal and therefore the SABRE system does not literally infringe the "substantially enclosed" claim language as a matter of law.

The Court further finds that any argument by Semitool that a seal formed by air flowing through the area defined by the SABRE system's head and bowl is equivalent to a seal formed by the head and the bowl is not supported by Semitool's evidentiary showing and is estopped as a matter of law due to the prosecution history of the '310 patent. *See Loral Fairchild*, 181 F.3d at 1322-23.

During the patent prosecution of the '310 patent, the limiting claim language "substantially enclosed" was added in order to overcome any objections from the PTO that the head over the bowl configuration was rendered obvious by the Aigo patent. Semitool asserted to the PTO that the Aigo patent did not contemplate containing the processing fluid within a space formed by the head and the bowl, and that the position of the head and the bowl in the '310 patent allows the processing space to contain gaseous or liquid processing fluids.

At the February 18, 2000 hearing, Semitool specifically argued that if the tool in Figure 1 of the Aigo patent used gaseous vapors to process silicon wafers, that tool would infringe the "substantially enclosed" claim language of the Semitool patents. Semitool explained that, similar to the SABRE system, the air flow running

through the area defined by the head and the bowl of the tool in Figure 1 would act as seal to permit gas processing.

The Court finds that air flow cannot be an equivalent for a seal formed by the head and the bowl due to the fact that the PTO history establishes that the claim language in the '310 patent at issue was added to limit the way the head and bowl are positioned. If the position of the head and the bowl in the tool of Figure 1 of the Aigo patent is sufficient to effectively process a wafer using the gas phase of chemical due to a seal formed by the air flow, this interpretation of "substantially enclosed" is estopped due to the fact that is would effectively read this claim language out of Semitool's patents. Semitool added the "substantilly enclosed" language to overcome the Aigo prior art rejection, it cannot now reclaim the Aigo subject matter through the doctrine of equivalents. *See Wang*, 103 F.3d at 1578 (finding that arguments and amendments made to secure allowance of a claim, especially those distinguishing prior art, presumably give rise to prosecution history estoppel).

2. Effective gas processing is impossible in the SABRE system

The Court next turns to Novellus' argument that effective processing using the gas phase of a chemical is impossible in the SABRE system. Novellus states that the SABRE system is designed to facilitate the making of computer chips through the electrochemical deposition of copper metal onto a silicon wafer, and is not designed to use gas to process a silicon wafer. *See* Lu Decl. Ex. O

(Patton Depo. TR:261). Novellus asserts that the system has never been used for gas processing. *See id.* Novellus points out that the Court has found that "electrochemical deposition of copper metal onto a wafer may be performed without any need to use a sealed chamber to exclude ambient air." Order of September 24, 1999 at 13. Novellus also points out that the Court further noted that chemical gas processing can be materially affected by ambient air flow. *See id.* at 13-14.

Novellus contends that the specifications of the SABRE system permits ambient air flow (established without dispute by their experts) which would contaminate any attempt to use the plating cell for gas processing.

Novellus' expert Douglas Peltzer states three reasons why the level of air drawn in by the exhaust in the SABRE system is incompatible with gas processing. First, gas processing is extremely sensitive to contamination, particularly airborne contamination in the form of dust and other particles. *See* Peltzer Decl. ¶¶ 24, 45. Novellus argues that the undisputed airflow turbulence in the plating cell would inevitably cause a mixing of ambient air with any processing gases inside the plating cell. *See* Reply Brief Lu Decl. Ex. F (Supp. Tynan Decl. ¶ 9). Second, gas processing is prone to uniformity and repeatability problems caused by variations in the concentrations of processing vapors across the face of the wafer being processed, and thus the system must provide assurance of homogeneous presentation of the reactant gas. *See* Peltzer Decl. ¶¶ 25-28, 45. Peltzer states that the drafts, leakages, and eddies of ambient air present in the SABRE system would have an adverse affect on the homogeneity

of the gas vapors across the face of the wafer. *See* Reply Brief Lu Decl. Ex. E (Supp. Peltzer Decl. ¶¶ 7-8). Peltzer offers that a lack of homogeneity is deleterious to uniformity. *See id.* Third, gas processing makes use of vapors that are costly, not only to purchase but also to dispose of safely without harm to workers or the environment. *See id.* at ¶ 29, 45.

Novellus points to the fact that the specification section of the '708 patent Column 4, in discussing the objectives and advantages of the invention states "[t]hus there remains a strong need in the art for gaseous HF and other chemical processing which will provide uniform and repeatable results with the highly effective etching rates while achieving low contamination and particle counts." Novellus contends, therefore, that effective gas processing must mean as a matter of law that: (1) an acceptable processing or etch rate has been achieved, (2) there is acceptable uniformity across the wafer, (3) repeatability (uniformity from one wafer to the next) is occurring, and (4) the particle count or contamination has been kept to a minimum.

Semitool argues that it has generated evidence which establishes that there is a genuine issue of material fact as to whether the SABRE system can effectively permit gas processing. First, Semitool contends that the opinions of Novellus' expert witness Peltzer have been discredited through cross-examination. Semitool contends that Peltzer admitted his uncertainty as to whether or not HF vapor etching, a type of gas processing, can be done in the presence of air. *See* Polit Decl. Ex. 8 (Peltzer Depo. TR:144). Further, Semitool contends that Peltzer exposed

his limited knowledge of HF vapor processing during the his deposition.

> Q. And you are aware of instances where HF vapor etching is carried out with HF vapor plus air, are you not?
>
> A. I am not sure. In the HF vapor environment I am not that familiar. My understanding in general is that the air is eliminated.

Id. (Peltzer Depo. TR:150). Finally, Semitool contends that Peltzer based his conclusions that the SABRE's exhaust system would affect the concentration of vapors across the face of the silicon wafer without actually looking at the actual conditions within the SABRE system. *See id.* (Peltzer Depo. TR:154-57). Specifically, Semitool points to a lack of knowledge concerning: (1) the relative mass of air moving below point B on a diagram of the SABRE system submitted as Exhibit 2 of Polit's declaration verus [sic] the mass of air exhausted from the annulus between points A and B on the diagram and (2) whether the air flow remains close to the splash shield or top hat as it moves downward in the plating cell. *See id.*

Next, Semitool offers evidence from two experts that gas processing of silicon wafers can occur within the SABRE system, accepting the measurements submitted by Novellus as true for the purpose of this motion. First, Semitool's processing engineer Eric Bergman carried out a series of tests using a modified Equinox, a device used by Semitool as a gas processing tool. *See* Polit Decl. Ex. 10 (Bergman Decl. ¶¶ 4-11). Bergman operated the modified Equinox with air flows greater than the measurements of SABRE system's exhaust flows produced by Novellus' expert Tynan. *See id.* Bergman asserts that he obtained

acceptable etching rates and, by his estimate although not directly tested, acceptable etching uniformity as well. *See id.* (Bergman Decl. ¶¶ 14, 18-21). Bergman further states that in many kinds of HF vapor etching, uniformity is not a great concern, particularly in those applications where etching is carried out to remove all of the silicon dioxide present on the surface of the wafer. *See id.* (Bergman Decl. ¶ 10).

Semitool then points out that Novellus' expert, Peltzer, was asked what would result if the tool diagramed in Figure 1 of the '708 patent were provided with an exhaust tube capable of providing exhaust velocities as measured by Tynan, and then operated with the head in a "cracked" position to leave an annular gap from 1/2 to 3/4 inch between the head and the bowl. *See* Polit Decl. Ex. 8 (Peltzer Depo. TR:172-74). Peltzer responded:

> I think as we described before because HF is present and you are going to get some kind of chemical action, some etching will occur, but the rate of that etching and the local characteristics of that etching are just beyond me. I would have no confidence that system would be controllable. I would expect the etch rate to go down substantially and expect the etch uniformity to disastrously deteriorate.

Id. (Peltzer Depo. TR:174). Following up, Semitool then asked Peltzer whether the same consequences would result if a SABRE tool was used for HF etching to which Peltzer replied in the affirmative. *See id.* Semitool, therefore, argues that Bergman's results directly contradict the conclusions of Novellus' expert.

Semitool next provides a study of the geometry of the SABRE system conducted by Professor Allan Myerson. Myerson concluded that the air flows in the SABRE system plating cell should not disturb the boundary layer between the HF gas and the silicon dioxide on the wafer with which the HF reacts, which Semitool asserts is the controlling question on whether the air flow interferes with HF processing of the wafer in the SABRE system. *See* Polit Decl. Ex. 12 (Myerson Decl. ¶¶ 9-15). Myerson then constructed a simplified computer model of the flow patterns in the SABRE system to test his conclusion. Using the data from this computer model and Bergman's experimental evidence, Myerson asserts that the SABRE system has the capability of etching with the HF chemical. *See id.* (Myerson Decl. ¶¶ 23-32).

As plaintiff, Semitool bears the burden of proving the SABRE system infringes the claims of its '708 and '310 patents. Novellus has offered an expert opinion that the amount of air flow in the SABRE system would prevent effective gas processing. Semitool has responded by providing the opinions of two experts, both of whom had conducted studies which they claim directly supports a conclusion that effective processing of wafer can occur in a machine with the characteristics of SABRE system using the gas phase of a processing chemical.

The Court finds, however, that Semitool's experts have not established a genuine issue of material fact that effective gas processing can occur within the SABRE system. As specifically laid out in Column 4 of the '708 patent, effective gas processing entails four elements: a high etch rate, uniformity, repeatability, and low contamination. The tests conducted by Bergman and supported

by Myerson's model only establish a genuine issue of material fact that high etch rates would be capable in the SABRE system. Although Bergman claims that from the data collected from his tests, he is able to estimate that the uniformity achieved falls within acceptable levels, Bergman offers speculative opinion only as to this issue, as he did not directly test for uniformity. Novellus also points out several flaws in the methodology underlying Bergman's speculations. Therefore, it appears to the Court that the evidence identified by Semitool in support of the remaining three criteria necessary to establish effective gas processing is insufficient. The Court finds that the evidence proffered by Semitool does not raise a genuine issue of material fact on effective gas processing and Semitool has failed to meet its burden of proof on this issue.

In summary, there does not appear to be a genuine issue of material fact that Novellus infringed the claim language "substantially enclosed." The SABRE system does not literally infringe this language for two reasons: (1) the plating cell (the bowl) and the drive assembly (the head) do not form a seal and (2) Semitool has not met its burden to show that effective gas processing can occur within the SABRE system. Further, the SABRE system does not infringe the claim language under a theory that a seal formed by air flow is the equivalent of seal formed by the head and bowl. First, Semitool, as with literal infringement, has not met its burden in raising a material issue of genuine fact that effective gas processing can occur using air flow as a seal, and second, the prosecution history behind the inclusion of the "substantially

enclosed" language in Semitool's patents prevents Semitool from taking a position that would effectively eliminate the limitations imposed by this language.

III. CONCLUSION

For the foregoing reasons, the Court GRANTS Novellus' motion for summary judgment.

IT IS SO ORDERED

Dated: March 17, 2000

/s/ D. Lowell Jensen
D. Lowell Jensen
United States District Judge

UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF CALIFORNIA

SEMITOOL, INC., a Montana corporation, Plaintiff, v. NOVELLUS SYSTEMS, INC., a California corporation, Defendant.	No. C-98-3089 DLJ ORDER (FILED SEP 24 1999)

On August 27, 1999, the Court heard argument on claim construction of the patents at issue in this suit. Keith V. Rockey and William E. Trautman appeared on behalf of plaintiff; Morgan Chu, Bruce D. Kuyper, Samuel K. Lu, and Fernanda K. Lai appeared for defendant. Having considered the arguments of counsel, the papers submitted, the applicable law, and the record in this case, the Court hereby construes the relevant claims as follows.

I. BACKGROUND

A. Factual Background and Procedural History

Semitool, Inc. ("Semitool") filed an action in this Court on August 10, 1998 against Novellus Systems, Inc. ("Novellus"). The suit alleges that the SABRE equipment, which is manufactured by Novellus for processing substrates such as semiconductor wafers, infringes U.S. Patents 5,222,310 ("the '310 patent") and 5,377,708 ("the '708 patent"). The specific claims at issue are claims 25, 32-37, 50, and 55-56 of the '708 patent and claims 1 and 3-5 of the '310 patent. Semitool owns the rights to the '310 and

'708 patents. Having alleged willful infringement, Semitool seeks a permanent injunction, treble damages, costs and attorney's fees, and pre- and post-judgment interest.

In answer, Novellus alleges the affirmative defenses of invalidity and failure to mark as required by 35 U.S.C. § 287. As a counterclaim, Novellus seeks a declaratory judgment of noninfringement and invalidity for failure to comply with the requirements of 35 U.S.C. §§ 102, 103, and 112.

Both the '708 and '310 patents are directed at the design of an apparatus in which the processing steps for manufacturing semiconductor wafers are carried out. Semitool is a company that manufactures tools used in the processing of wafers.

A semiconductor commonly begins life as a silicon wafer that undergoes a series of chemical and electrochemical processes. Although the steps may occur in different orders and may be repeated, the following explanation of the steps is somewhat typical.

The first step involves oxidizing the surface of the silicon wafer to create an insulated layer. In the next step a patterned layer is formed over the insulated layer so that only select portions of the insulated layer are exposed. An etchant is then applied to remove the exposed portions of the insulated layer. The exposed surface of the silicon is doped with a chemical substance that affects the electrical characteristics of the silicon. In the next phase, a conducting metal is electrochemically deposited to establish electrical connections between various areas of the semiconductor. In between steps, the

wafer may be stripped and cleaned to remove contaminants that might adversely affect subsequent processes.

Different processes have different engineering concerns. When etching a wafer using the highly corrosive vapor of hydrofluoric acid, the design must guard against contamination of the vapor from the ambient air while also shielding equipment outside the vapor bath from the corrosive effects of the vapor. By comparison, when using liquid processing, the primary concern is to protect the liquid and the wafer from contaminants.

The '708 and '310 patents are directed at a tool for single-wafer processing. The tool is an automated, multi-station wafer processor tool in which various chemical and electrochemical processes can be carried out.

The '708 patent sets forth an automated wafer processing tool which consists primarily of a movable head that is capable of "mating" with a processing bowl. The movable head contains a structure for holding the wafer such that the wafer face to be processed is positioned facing downward into the bowl. This wafer support is mounted on a drive shaft that is connected to a motor such that the wafer support can be rotated.

The processing bowl, in the preferred embodiment, contains a pool of chemical used to process the wafer. For example, if the process to be performed is etching, the chemical might be hydrofluoric acid in a form that gives off vapors that etch the surface of the wafer. A system for supplying and recycling the processing chemical is part of the bowl's design. The bowl can also be designed with ports through which drying gases can be introduced into the bowl.

A pneumatic cylinder is provided to raise and lower the processing head over the processing bowl so that wafers may be inserted to be processed and removed after processing.

The entire processing unit, consisting of head, bowl, and pneumatic cylinder, is mounted inside a cabinet. This cabinet is designed so that the surrounding environment can be controlled for contaminants, including particulates, humidity, and other elements in the ambient air that can adversely affect processing. The cabinet can be designed to contain multiple processing chambers. A robotic transfer unit may be used to move wafers from a wafer inventory to a processing chamber and between processing chambers.

The '310 patent discloses a similar processing unit. This patent reveals a chamber that is defined by a processing base and a complementary processing head. The head and base are movable relative to each other.

B. Legal Standard

Patent infringement analysis consists of a two-step process. *See Cybor Corp. v. FAS Technologies, Inc.*, 138 F.3d 1448, 1454 (Fed. Cir. 1998). In the first step, the court determines the appropriate scope and meaning of the patent in a process known as claim construction. *See id.* (*citing Markman v. Westview Instruments Inc. (Markman II)*, 517 U.S. 370, 371-3 (1996)). The second step involves comparing the properly interpreted claim to the accused device to determine whether infringement exists. *See Markman v. Westview Instruments Inc. (Markman I)*, 52 F.3d

967, 976 (Fed. Cir. 1995). Claim interpretation is a question of law for the court to decide. *See Markman II*, 517 U.S. 370.

The scope and meaning of claim language is properly constructed through the use of intrinsic and extrinsic evidence. "The intrinsic evidence, and in some cases, the extrinsic evidence, can shed light on the meaning of the terms recited in the claim, either by confirming the ordinary meaning of claim terms or by providing special meaning for claim terms." *Renishaw Plc. v. Marposs Societa Per Azioni*, 158 F.3d 1243, 1248 (Fed. Cir. 1998).

Intrinsic evidence consists of the claims, the written description of the specification including any relevant drawings, and, if in evidence, the prosecution history. *See Wright Medical Tech. Inc. v. Ostoenics Corp.*, 122 F.3d 1440, 1443 (Fed. Cir. 1997). Extrinsic evidence is "that evidence which is external to the patent and file history, such as expert testimony, inventor testimony, dictionaries, and technical treatises and articles, [and] prior art." *Bell & Howell Document Management Prods. Co. v. Altek Sys.*, 132 F.3d 701, 706 n.5 (Fed. Cir. 1997). It is improper for a court to consider extrinsic evidence when the intrinsic evidence clearly construes the claim. *See Altek*, 132 F.3d at 706 n.5 (*citing Vitronics Corp. v. Conceptronic, Inc.*, 90 F.3d 1576, 1584 (Fed. Cir. 1996)).

1. Intrinsic Evidence

The court first examines the intrinsic evidence to derive the meaning and scope of a claim. *See Markman I*, 52 F.3d at 976. The claim construction inquiry begins and ends in all cases with the actual words of the claim. *See*

Abtox Inc. v. Exitron Corp., 122 F.3d 1019, 1023 (Fed. Cir. 1997); *Vitronics*, 90 F.3d at 1582. These words are to be given their ordinary meaning to one experienced in the art, unless the patentee has assigned his own definition to them. *See York Prods., Inc. v. Central Tractor Farm & Family Ctr.*, 99 F.3d 1568, 1572 (Fed. Cir. 1996). If the patentee has elected to be his own lexicographer, the particular meaning chosen must be stated in the specification "with reasonable clarity, deliberateness, and precision" before it can affect the claim. *See Renishaw*, 158 F.3d at 1249 (quoting *In re Paulsen*, 30 F.3d 1475, 1480 (Fed. Cir. 1994)). Also, the meaning of a claim term will be construed to have the same interpretation in every claim in which it is used unless there is a clear indication otherwise. *See Southwall Tech. Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1579 (Fed. Cir. 1995).

If questions remain after examining the claims themselves, the claim language is next read in light of the specification. *See Vitronics*, 90 F.3d at 1582; *Markman I*, 52 F.3d at 976. One may look to the written description to define a term in a claim limitation, for a claim must be read in view of the specification of which it is a part. *See Renishaw*, 158 F.3d at 1248. "Usually, [the specification] is dispositive; it is the single best guide to the meaning of a disputed term." *Vitronics*, 90 F.3d at 1582. However, if it is not necessary to rely on a limitation in the specification to interpret what the patentee meant by a particular term or phrase in a claim, that limitation is "extraneous" and cannot constrain the claim. *See id.* at 1249; *Hoganas AB v. Dresser Indus., Inc.*, 9 F.3d 948, 950 (Fed. Cir. 1993). "A claim must explicitly recite a term in need of definition

before a definition may enter the claim from the written description." *Renishaw*, 158 F.3d at 1248.

Thirdly, if questions remain after assessing the claims in light of the specification, the Court may turn to the prosecution history. *See Vitronics*, 90 F.3d at 1582. The prosecution history contains the "undisputed public record of proceedings in the Patent and Trademark Office." *Markman I*, 52 F.3d at 980. This record reveals the patentee's understanding of the claim and terms within the claim at the time the patentee applied for the patent. *See id.* Any interpretation that is provided or disclaimed by the patentee during proceedings with the Patent and Trademark Office shapes the claim's scope. *See id.* at 1576; *Loctite Corp. v. Ultraseal, Ltd.*, 781 F.2d 861 (Fed. Cir. 1985). "Claims may not be construed one way in order to obtain their allowance and in a different way against accused infringers." *Southwall*, 54 F.3d at 1576. If prior art exists in the prosecution history, the court may examine this material as intrinsic evidence. *See Vitronics*, 90 F.3d at 1582. Prior art is useful because it "gives clues as to what the claims do not cover." *Id.*

2. Extrinsic Evidence

Extrinsic evidence is "all evidence external to the patent and prosecution history, including expert and inventor testimony, dictionaries, and learned treatises." *Markman I*, 50 F.3d at 980. Generally, the proper meaning of a claim should be clear without the introduction of extrinsic evidence. *See id.* at 986. A court may not rely on extrinsic evidence to clarify ambiguities in the claim language. *See id.* Nor may extrinsic evidence be used to vary

or contradict the terms of the claims or the specification. *See id.*; *Vitronics*, 90 F.3d at 1584. "[I]f the meaning of the disputed term is clear from the intrinsic evidence . . . it cannot be altered or superseded by [extrinsic evidence]. Competitors are entitled to rely on the public record of the patent. . . . " *Key Pharmaceuticals v. Hercon Labs Corp.*, 161 F.3d 709, 716-17 (Fed. Cir. 1998).

However, external sources may be used to assist the court, which may be unfamiliar with the relevant terminology and lack the relevant technical expertise necessary to understand the claim terms. *See Markman I*, 52 F.3d at 986. External sources can help the court "explain scientific principles, the meaning of technical terms, and terms of art that appear in the patent and the prosecution history." *Id.* The court may use technical treatises and dictionaries at any time to form a better understanding of the claim terms. *See Vitronics*, 90 F.3d at 1584 n.6. But a dictionary definition may not be used if it contradicts the meaning of the term found in the patent documents. *See id.* Where there are several common meanings for a claim term expressed in a relevant dictionary, the court must rely on the patent disclosure "to point away from the improper meanings and toward the proper meaning." *Renishaw*, 158 F.3d at 1250.

Expert testimony may assist the court in understanding "how a technician in the field, reading the patent, would understand the claims." *Markman I*, 50 F.3d at 981. However, "where the patent documents are unambiguous, expert testimony regarding the meaning of a claim is entitled to no weight." *Vitronics*, 90 F.3d at 1584. The testimony of an inventor or an attorney regarding the meaning of a claim has no effect if it is not expressly

stated in the patent document. *See Vitronics*, 90 F.3d 1576; *see also Altek*, 132 F.3d at 706. Prior art and technical treatises are preferred over expert testimony. *See Vitronics*, 90 F.3d at 1584.

If after consideration of the intrinsic evidence there remains doubt as to the exact meaning of the claim terms and it is necessary for a court to resort to extrinsic evidence, another claim construction canon comes into play. *See Digital Biometrics, Inc. v. Identix, Inc.*, 149 F.3d 1335, 1344 (Fed. Cir. 1998). When a claim can be interpreted broadly or narrowly, a court must adopt the narrow meaning when the intrinsic evidence supports such a finding and the broader definition "raises questions of enablement under 35 U.S.C. § 112." *Id.* (*citing Athletic Alternatives, Inc. v. Prince Mfg. Inc.*, 73 F.3d 1573, 1581 (Fed. Cir. 1996)). This principle exists because the patentee has the burden to "particularly point out and distinctly claim the subject matter which the applicant regards as his invention," under section 112. *Id.*

II. DISCUSSION

The '310 patent and the '708 patent have a common ancestry and a number of terms in common. The claims at issue for the '708 patent are claim 25 and its dependant claims 32-37 and claim 50 and its dependant claims 51-56. The claims at issue for the '310 patent are claim 1 and its dependant claims 3-5.

The parties are in general agreement regarding some claim elements. They agree that the claims involve a framework to which at least one processing bowl is mounted. They also agree that the claims at issue disclose

at least one system for supplying at least one processing chemical to the at least one processing bowl. There are, however, some elements for which they do not agree on the construction.

A. Substantially Enclosed Processing Chambers

The central dispute between the parties concerns the interpretation of the phrase "substantially enclosed processing chamber," as used in claims 25 and 50 of the '708 patent, and the related phrase "substantially enclosed processing space," as used in claim 1 of the '310 patent.

The relevant element disclosed in claims 25 and 50, which use identical language, recites

> at least one processing head mounted for controlled movement between at least one processing position wherein the processing head is in an operative relationship with the processing bowl to define a substantially enclosed processing chamber, and at least one loading position wherein the processing head is removed from the processing bowl for loading or unloading wafers from the at least one processing head.

The relevant claim language for claim 1 of the '310 patent recites the following element:

> at least one processing base and a complementary processing head mounted to the frame, the processing base and complementary processing head being moveable relative to one another between a closed relative position forming a substantially enclosed processing space for containing processing fluids between the processing

> base and the processing head and an open relative position allowing transfer of wafers to and from the processing head.

Novellus contends that the phrases "substantially enclosed processing chamber" and "substantially enclosed processing space" must be interpreted as requiring an "essentially gas-tight processing space" that is isolated from the surrounding environment. Semitool argues that "substantially" means that the processing head's relationship to the processing bowl is such that the chamber is nearly completely surrounded, but not entirely. The claims make clear that the chamber is only "substantially enclosed" when the head is in the closed processing position over the bowl.

The language of claims 25 and 50 do not otherwise define what it means to be "substantially enclosed," thus it is necessary to look elsewhere for the meaning of this phrase. Claim 1 of the '310 patent recites that the purpose of the "substantially enclosed" space is to contain processing fluids. This language provides only limited aid in determining what it means to be a "substantially enclosed" chamber or space.

The Court is to give the words used in a claim their ordinary meaning to one skilled in the art unless the patentee has provided an alternative meaning. *See York Prods.*, 99 F.3d at 1572. "Enclosed" has several ordinary meanings. It can mean "surround," as in to surround a yard with a fence. *See Webster's Third New Int'l Dictionary* (1986). It can also mean "confine" in the sense of completely surrounding or enveloping an object or space on all sides, the way a sealed envelope confines or encloses a letter within it. *See id.* The parties do not argue that the

patent applicant chose to define "enclose" in a special manner. Thus it is necessary to determine which ordinary meaning was intended. When there are multiple ordinary meanings for a term, the patent disclosure must be relied upon "to point away from the improper meanings and toward the proper meaning." *Renishaw*, 158 F.3d at 1250.

In the present claims, "enclosed" is modified by "substantially." Accordingly its meaning is dependent in part on how the term "substantially" is meant to modify the concept of being "enclosed." "Substantially" when used in combination with "enclosed" naturally is addressed to matters of degree. Given this context, the most relevant ordinary meaning of "substantally" is "largely, but not wholly." *See Webster's Ninth New Collegiate Dictionary* (1983).

Semitool contends, based on the opinions of its experts, that the degree of confinement of the processing chamber or space is dependant on the process taking place, and its associated engineering problems, such as contamination. Thus according to Semitool, the meaning of "substantially enclosed" is process dependent. According to Semitool, the term "substantially enclosed processing chamber [or space]" should be construed to recite a processing head and bowl positioned relative to each other so as to form a space that is sufficiently confined such that ambient conditions do not materially affect the nature of the chemical processing being performed in the chamber. For example where highly corrosive hydrofluoric acid is used the common practice is to use a sealed chamber. Scranton Decl. ¶¶ 20, 22, 33. But, electrochemical deposition of copper metal onto a wafer may be

performed without any need to use a sealed chamber to exclude the ambient air.

The latter process dependant [sic] definition is at odds with the ordinary meaning of "substantially enclosed." A device that remains open, because the process does not require protection from the ambient air, is not one that is "largely, but not wholly, enclosed." For this construction to be adopted in lieu of "a largely, but not wholly, enclosed processing chamber," there must be support for this broad interpretation in the specifications or prosecution history.

Such a broad interpretation is not supported. First, the embodiment disclosed in the '708 patent is addressed to the use of vapor etchants, a process for which Semitool admits that a sealed chamber is preferred. Even though the claims are not written as narrowly as the specification, and thus can be read to cover any process that could occur inside the described chamber, a person reading the specification would not conclude that the design is one in which, during certain processes, the head and bowl would be so separated as to not effectively shield a gas contained therein.

Second, when the '310 patent was before the examiner, the examiner initially rejected the claims as obvious over Aigo. The Aigo reference consists of a base and a wafer holder that sits on the base and delivers the wafer to the base for processing. In the examiner's view, the Aigo reference rendered obvious the design of a head over a base. '310 file wrapper at 0000101. To overcome this objection the applicant added the phrase "substantially enclosed" to the claim language. Any interpretation

provided or disclaimed by the applicant during prosecution for a patent is to be considered in determining the scope of the claims. *See Markman I*, 52 F.3d at 980.

In justifying this addition as sufficient to overcome the objection, the applicant contended that the Aigo device was one in which the fluid was designed to be pumped up through the base to the wafer surface and then to overflow the walls of the base. Thus Aigo did not contemplate keeping the fluid to be used confined within a space created by the combination of head and base. In contrast, the '310 apparatus was designed to contain the fluid in use inside the processing space. According to the applicant, the position of the head over the chamber in the '310 design "allows the processing space to contain the gaseous or liquid processing fluids. The Aigo reference has no ability to enclose the wafer and cannot process effectively using gases." Lu Decl., Ex. L at 5. The applicant also contended that an advantage of an enclosed space was that it minimized the risk that the processing fluid would be contaminated. '310 file wrapper at 0000098; Lu Decl., Ex. L at 5. The specification of the '708 patent also emphasizes the use of an enclosed space to shield processing fluids from contaminants. '708 patent, col. 4.

In reliance on the statements made to distinguish Aigo during prosecution, Novellus contends that the Court should define "substantially" as "the same as or very close to," *see Amhil Enter, Ltd. v. Wawa Ltd. v. Wawa, Inc.*, 81 F.3d 1554, 1562 (Fed. Cir. 1996), and thus interpret "substantially enclosed" as "essentially gas-tight." This is not an ordinary meaning of "substantially." In *Amhil*, "substantially vertical" was narrowly interpreted as

"essentially vertical" because the phrase had been so used in the specification and because such an interpretation was necessary to avoid the prior art. *See Amhil*, 81 F.3d at 1561-62. The everyday meaning of "substantially" was rejected in that case because the specification and prosecution history better supported a narrower construction and because of invalidity concerns. *See id.* A narrow interpretation of "substantially" in this case can only be adopted if the intrinsic evidence points away from the ordinary meaning toward the more narrow special usage.

Here the applicant's statement during prosecution of the '310 patent and the specification of the '708 patent both teach the importance of a chamber enclosed such that it permits effective processing with gases. These are real and significant limitations on the claims. Ignoring these limitations in construing the claim would raise a significant risk that the patents would be invalid in light of Aigo. A claim should be construed to preserve its validity, if possible, where there is a basis for such a construction. *See Amhil*, 81 F.3d at 1562 (citing to narrowing uses in the specification and prosecution history). The representations made to the examiner and the '708 specification, both of which indicate that the invention was inventive over the prior art in that it permitted effective processing using gases, provide a basis for a narrowing construction.

Accordingly, the court finds that the ordinary meaning of "substantially enclosed" must be construed in a manner consistent with the representations made to the examiner and in the specifications. "Substantially enclosed" must be defined by reference to the ability of

the processing chamber in the closed position to process using common processing vapors that are at risk of contamination.

Novellus contends that "substantially enclosed" must mean "essentially gas-tight," which is a very narrow interpretation. According to Novellus, the chamber but be essentially sealed because one of the fluids that would be used is the highly corrosive gas state of hydrofluoric acid, which requires a sealed chamber. In so arguing, Novellus relies on the preferred embodiment of the '708 patent, which discloses a device for processing using hydrofluoric acid gas. However, where a claim is expressed in general descriptive terms, courts ordinarily are not to limit that term to a specific range simply because it appears in the specification or prosecution history. *See Renishaw*, 158 F.3d at 1249). The claims of the '708 and '310 patents are phrased broadly as addressed to processing fluids, not just the vapor state of hydrofluoric acid. Thus relying on the properties of hydrofluoric acid alone to determine the meaning of "substantially enclosed" for the '708 patent is an improper importation of a limitation from the specification into the claim.

However, Novellus' argument does not end here. Novellus also contends that language in the '708 and '310 patents referring to the ability to pressurize the chamber requires that "substantially enclosed" be interpreted as "essentially gas-tight." The '708 patent describes the preferred embodiment as one in which the vapor processing is

> done within an enclosed or confined processing chamber at pressures which are sufficiently high to prevent boiling of the liquid processing fluid.

> Processing pressure is in the approximate range of 100-2000 torr are operable dependent upon temperature of the liquid mixture. Pressures in the range of 500-1500 torr are more preferable with atmospheric pressures in the range of 600-900 torr most preferable.

'708 patent, col. 6. Novellus, argues that in order for pressurization to occur inside the chamber, as discussed in the specification, the chamber must be one that is essentially gas-tight.

However, the specification describes the processing head as one that "mates" with the processing bowl "to confine a processing chamber." *Id.* "The head is . . . then positioned in a sealing relationship with the bowl *or* otherwise suitably adjusted to confine the processing chamber against drafts and other substantial leakages which might affect the homogeneous vapor phase. . . . " '708 patent, col. 9 (emphasis added). The specification specifically contemplates a relationship in which some leakage is permitted, just not so much that it is no longer possible to process effectively with a gas phase chemical.

The Court does not believe that the "essentially gas-tight" construction suggested by Novellus would be proper. This language could be read as "completely gas tight" when it is clear that the patents allow for some leakage. The Court finds that the proper construction of the phrase "substantially enclosed processing chamber" or "space" is that when the head is in a closed position over the bowl the head and bowl substantially enclose a processing chamber or space such that they form a seal which is sufficiently closed to permit the effective processing of a wafer using the gas phase of a processing

chemical known in the art, regardless of whether the chemical to be used at any given time is in a gas or liquid state.

B. Relationship of the Processing Head to the Processing Bowl or Space

A number of related arguments are raised by the parties about the relationship of the processing head to the processing bowl. First, Novellus contends that the element "head" should be construed to mean that from a selected orientation, the element called the head is disposed above the processing base. In addition, Novellus argues that the head and base can be mounted horizontally such that the head is mounted side to side with the base. Semitool contends that while the head may be oriented horizontally when it is away from the bowl, the bowl itself is always mounted vertically. Thus in the processing position the head is always oriented vertically above the bowl.

Neither the claims or specification limit how the bowl can be oriented or how the head can be oriented to the bowl in any position other than the closed position. It is clear, however, from the claims and specification, that when in the closed position, the head is disposed over the base in the same orientation as the base.

Novellus also argues that the term "complementary" means that the head in the '310 patent, when placed together with the bowl, forms a single component. Semitool does not argue the meaning of complementary. Given the Court's interpretation of substantially enclosed and the representations made to the Court during the hearing

that the head and bowl meet when in the closed processing position, the Court finds that "complementary" means the head and bowl form a single component when in the closed position.

There is a construction proposed by Novellus that the language of claim 5 of the '310 patent, which refers to an opening on the processing bowl for "mating" with the processing head, requires that the head physically connect with the bowl. Again, given the Court's interpretation of substantially enclosed and the representations made to the Court that the head and bowl touch when in the closed position, the Court finds that "mate" requires that the head and bowl be in physical contact when in the closed position.

C. Wafer Support

Semitool argues that "wafer support" as used in claims 25 and 50 of the '708 patent is a structural limitation on the device; whereas Novellus contends that it is a means-plus-function limitation. These claims recite "at least one wafer support" designed to "detachably support" wafers on the processing head.

Paragraph six of 35 U.S.C. § 112, provides that "[a]n element in a claim . . . may be expressed as a means or step for performing a specified function with recital of the structure, material, or acts in support thereof. . . . " Such claims are to be construed to encompass the corresponding structure as described in the specification and any equivalents of that described structure. *See id.; Personalized Media Communications LLC v. International Trade Comm'n*, 161 F.3d 696, 702 (Fed. Cir. 1998).

The "use of the word 'means' creates a presumption that § 112, ¶ 6 applies . . . and . . . the failure to use the word 'means' creates a presumption that § 112, ¶ 6 does not apply." *Id.* at 703-04 (citations omitted). "These presumptions can be rebutted if the evidence intrinsic to the patent and any relevant extrinsic evidence so warrant." *Id.* at 704. The word "means" is not used in the claims as part of the description of "wafer support" and thus there is a presumption against finding a means-plus-function claim for which the burden to rebut falls to Novellus. "In deciding whether [the] presumption has been rebutted, the focus remains on whether the claim as properly construed recites sufficiently definite structure to avoid the ambit of § 112, ¶ 6." *Id.* at 704. (citing *Sage Prods. v. Devon Indus., Inc.*, 126 F.3d 1420, 1427-28 (Fed. Cir. 1997) ("[W]here a claim recites a function, but then goes on to elaborate sufficient structure, material, or acts within the claim itself to perform entirely the recited function, the claim is not in means-plus-function format" even if the claim uses the term "means")).

Novellus argues that the phrase "wafer support for detachably supporting wafers thereon" invokes purely functional terms and that the remainder of the claim element fails to recite a specific structure or material for performing that function.

The Federal Circuit has held that the claim language "lever moving element for moving the lever" is a means-plus-function claim, even though the catch-phrase "means for" was not used because the element's language did not provide any structure. *See Mas-Hamilton Group v. LaGard, Inc.*, 156 F.3d 1206, 1214 (Fed. Cir. 1998). The circuit found that "[t]he limitation is drafted as a function

to be performed rather than definite structure or materials." *Id.* at 1215. In contrast, even though the talismatic term "means" was used in another patent, the circuit nevertheless found that § 112, ¶ 6 was not invoked. *See York,* 99 F.3d at 1573-75. Specifically, the circuit found that the phrase "means formed on the . . . sidewall portions including a plurality of spaced apart . . . members protruding from the . . . sidewall portions and forming load lock . . . " did not invoke a function, but rather recited a structure.

Unless "wafer support" has something inherent in its ordinary meaning that would disclose a structure to one skilled in the art, the relevant language of claims 25 and 50 does not disclose a structure and thus should be interpreted as a means-plus-function claim. No structure for a "wafer support" is described in the claims and the phraseology of "wafer support" for detachably supporting a wafer is purely functional in nature.

Semitool argues that there is nothing in the intrinsic or extrinsic evidence to rebut the presumption. However, the phrase "wafer support," as recited in the claims, is consistent with the types of phrases that the Federal Circuit has interpreted as rebutting the presumption that the element is not in means-plus-function format. Semitool also claims that "wafer support" has an inherent structure understood by persons skilled in the art by referring the Court to the Aigo reference. However, that patent not only does not use the term "support" in its specification or claims, rather it uses "holder," but it also recites a structure for "holder" in the claims and thus cannot be understood as presuming that persons skilled in the art would know what structure is meant by holder.

Finally, Semitool directs the Court's attention to Novellus' expert, Douglas Peltzer. During his deposition he was asked what "wafer holder" meant. Peltzer Dep. at 12. In response he answered that it depended on the context. *See id.* This is not persuasive evidence that a person skilled in the art would understand what structure is meant by the phrase "wafer support."

The Court construes "wafer support" for detachably supporting a wafer as a means-plus-function claim. Accordingly, wafer support is construed as the structure defined in the specification, that of a plate having a plurality of fingers that grip the wafer at its peripheral edge, and any equivalents to that structure.

D. Means for Moving

Claims 1, 3, 4, and 5 of the '310 patent provide for a "means for moving" the processing head relative to the processing base. The parties agree that this is a means-plus-function claim. However, they disagree about the structure disclosed in the specification.

Novellus argues that the structure disclosed consists of a pneumatic cylinder that has two stop positions, one as far up as the stop mechanism will allow the cylinder to go, the open position, and one as far down as the depicted stop will allow the cylinder to go, the closed position. According to Novellus, the Court should interpret this element as disclosing a pneumatic cylinder having only two stop positions and any structural equivalents. Novellus concedes that a jury might find that some other linear actuators, the genus of which the pneumatic cylinder is a species, are structural equivalents.

The claim states that the base and head are "moveable relative to one another between a closed relative position . . . and an open relative position. . . . " Turning to the specification, it simply discloses a shaft that can be moved upwardly or downwardly. There is no indication in the claim or specification that the design is for a shaft that has only two stopping positions, fully closed and fully open. Therefore the Court construes the "means for moving" clause as disclosing a pneumatic cylinder or similar structure that moves upwardly and downwardly having at least an open position stop and a closed position stop, the latter of which is suitable for processing with gas phase chemicals. There may be other stops on the cylinder that may used [sic] to process wafers.

E. Swivel Base

Novellus contends that the phrase "swivel base" requires that the base that permits the robotic transfer until to swivel must be attached to the deck and frame of the wafer processing apparatus. Semitool contends that "swivel base" refers simply to that portion of the robotic wafer transfer unit permitting rotation of the arms. The specification refers to a robotic transfer unit having two arms that are mounted on a swivel base. '310 patent, col. 12. The relevant claim language recites "a robotic system with a swivel base and arms which can move horizontally and vertically." There is no basis in the specification or claim language for importing a limitation that the swiveling part be directly mounted to the deck of the apparatus and not higher than the deck. Therefore, the Court construes swivel base as requiring only that the arms attach to a base that swivels.

III. CONCLUSION

For the foregoing reasons, the Court construes the claims of the '708 and '310 patents as set forth above.

IT IS SO ORDERED

Dated: September 24, 1999

/s/ D. Lowell Jensen
D. Lowell Jensen
United States District Judge